Preliminary evaluation of Jordanian oil shale upgrading by froth flotation

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The recent surge in oil price has increased interest in use of oil shale as an alternative energy source. However, the presence of inorganic impurities in the oil shale matrix affect its oil yield and calorific value and may cause serious environmental problems if sulphur exists in high percentage. Therefore upgrading oil shale before retorting or direct combustion may be a necessity. Froth flotation is one of the possible methods for oil shale upgrading, but the energy required to grind oil shale matrix to -20 μm to liberate its kerogen may raise questions about the economic return of such process. However, recent advances in grinding technology and beneficiation of fine ores (*e.g.* fine coal) may reduce the cost of energy required for using froth flotation and makes the process more attractive. In this contribution, we first evaluated the grindability of Jordanian oil shale (El-Lajjun) using the standard bond work index. Liberation of oil shale kerogen was also evaluated by X-Ray Diffraction (XRD) and correlated with grinding time and the ratio of charge to grinding medium. Second, we evaluated oil shale flotation response using a 1 L Denver flotation cell at the following flotation and conditioning parameters: 50 wt % solids conditioning and 20 wt % flotation as well as wet and dry grinding. Flotation efficiency was measured in terms of oil yield and calorific value of concentrate for different types of collectors developed from local cheap materials with sodium silicate as an inorganic depressor.